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Subject: Biological Evaluation of Spruce Beetle Populations in Big  
Cottonwood Canyon, Salt Lake RD, Wasatch-Cache NF

To: Forest Supervisor, Wasatch-Cache NF

Enclosed is an evaluation conducted at the Brighton Ski Area, Big Cottonwood Canyon, Salt Lake RD, Wasatch-Cache NF. An indepth survey of the spruce beetle populations was completed in the Clayton Peak Slide area. This evaluation provides information on the current status, expected losses, and management recommendations for the spruce beetle.

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Enclosures

cc: (w/encl.)

Salt Lake RD

WO

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# FOREST PEST MANAGEMENT



STATE & PRIVATE FORESTRY

3420

Report No. R4-87-6

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Biological Evaluation of Spruce Beetle Populations  
Big Cottonwood Canyon, Salt Lake RD  
Wasatch-Cache NF

1987

by  
John Anhold, Entomologist

## ACKNOWLEDGEMENTS

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## ABSTRACT

The potential for increased spruce beetle caused mortality in surrounding stands is high. An evaluation of spruce beetle populations suggests from 320 to 578 standing trees could be infested with the current beetle levels in the Clayton Peak Slide debris. Immediate action is recommended either through tree removal or bucking and stacking. Adult beetles may emerge as early as September of 1987.

## INTRODUCTION

Outbreaks of spruce beetle (SB), Dendroctonus rufipennis (Kirby), have spotted the Rocky Mountain Regions for many years. Most often endemic populations increase rapidly to damaging levels where large numbers of spruce trees have been knocked down. Windthrown trees are often the center of these outbreaks, however, avalanches, such as the one within the Brighton Ski Area, can provide the catalyst for an epidemic.

The Clayton Peak avalanche, which downed 100 spruce trees, was examined following the winter of 1985-86. Survey results indicated the surrounding stands were at high risk to SB and heavy losses were predicted in the larger diameter trees (Anhold 1986). The following evaluation further describes potential losses based on a survey of the second year of the SB life cycle just prior to emergence.

INTERMOUNTAIN REGION



## METHODS

A 100 percent cruise was performed on snowthrown trees and parts of trees. A minimum tree size of 8 inches dbh, 5 feet from the largest end, was required to ensure adequate room for sampling. Sample points were established along the main bole, excluding areas 5 feet from each end. At each sample point three sets of 6 inch by 6 inch bark squares were removed to sample larval/pupal population levels (top, lateral, and bottom surfaces). The number of larvae, pupae, and adults were recorded. Diameter at tree midpoint and total length were gathered. This information, along with previous evaluation information (Anhold 1986), was used to determine the number of potentially infested trees (Schmid 1981).

## RESULTS & DISCUSSION

Spruce beetle attack densities varied significantly among trees in the Clayton Peak area. These findings are similar to spruce beetle studies reported by Dyer & Taylor (1971), Schmid & Frye (1977), and others. This variation reflects resident population abundance and beetle preference i.e., if one section of the bole has dense shade and another section has no shade, attacks will be higher in the shaded part. Similarly, fewer attacks will occur where the bottom surface had bark scraped off or was imbedded in the soil. This pattern reflects the beetles preference for shaded locations, infesting shaded surfaces in higher densities.

The mean number of beetles per square foot was highest on the bottom surface, intermediate on the lateral surface, and lowest on the top surface (see calculations). The reverse was true for Ips beetle attacks. In almost every case extensive Ips pilifrons colonization was occurring in the top surfaces. The rapid colonization by Ips beetles has a beneficial effect, reducing available food supplies to SB and accelerating the drying process of the down tree.

The average infested bark area per tree was 172.4 square feet. The mean number of beetles per square foot was 28.3. From this and the number of snowthrown trees a potential number of beetles available to attack standing trees was calculated at 475,993. The average diameter of the surrounding spruce trees was computed to be 20.3 inches. This diameter and tables described in Schmid (1981) can then be used to estimate the number of beetles required to cause mortality of that size tree. Dividing the number of beetles required to kill a certain size of tree into the potential number of attacking beetles gives the number of potentially infested trees. The Clayton Peak slide area will produce an estimated 4,857 spruce beetles per tree. This equates to 320 - 578 trees that could become infested in the surrounding stands (see calculations).

Predictions made with this method will overestimate the number of potentially infested trees because beetle numbers will be further reduced through overwintering and dispersal mortality. However, the estimate will be useful in assessing potential tree mortality. The potential problem can be evaluated further by comparing the average diameter of standing trees and other stand characteristics to the risk levels of the characteristics used in the stand rating scheme (Anhold 1986). When future studies define overwintering and dispersal mortality, this prediction scheme will become more accurate and more useful.





### RECOMMENDATIONS

Alternatives and recommendations for consideration have been outlined in the Biological Evaluation by Anhold (1986). It is most critical that the downed material be either removed from the site or bucked into 18 inch bolts to prevent SB emergence and subsequent tree mortality. With the abnormally warm weather during the winter and spring of 1987, brood development is approximately one month ahead. This could result in adult emergence as early as September 1987, shortening the window in which control measures can be completed. Removal of material implies transporting logs out of the canyon.

### LITERATURE CITED

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- Schmid, J. M. and R. H. Frye. 1977. Spruce beetle in the Rockies. USDA Forest Service General Technical Report RM-49. 38 p.
- Schmid, J. M. 1981. Spruce beetle in blowdown. USDA Forest Service Research Note RM-411. 5 p.



# CALCULATIONS

## 1. Infested bark area per tree:

$$A = 3.14(d)(l)$$

$$A = 3.14 (.95) (57.8)$$

$$A = 172.42$$

where A = average infested bark area per tree  
 d = mean diameter in feet at the tree midpoint  
 l = mean total length

## 2. Mean number of beetles per square foot:

$$X = t + 2s + b$$

$$X = 108 + 2(570) + 1,062$$

$$X = 2,310$$

where X = mean number of beetles per square foot  
 t = mean number of beetles in the top samples  
 s = mean number of beetles in the side samples  
 b = mean number of beetles in the bottom samples

## 3. Potential number of beetles available to attack standing trees

$$P = (A)(X)(N)$$

$$P = (172.4) (28.17) (98)$$

$$P = 475,993$$

where P = potential number of beetles available to attack standing trees  
 N = number of snowthrown trees

